HP 3000 Series II/III Computer Systems
MANUAL OF STAND-ALONE DIAGNOSTICS

HP 7905A/7920A/7925A
DISC DRIVE VERIFIER
STAND-ALONE SLEUTH PROGRAM

SLEUTH07

HEWLETT PACKARD

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TABLES

HOW TO USE THIS MANUAL

- If you are familiar with SLEUTH (D411) and SLEUTH07, refer to Section I.
- If you are not familiar with this verification program and the SLEUTH utility, read Sections II and III before referring to Section I.
- This manual references the follcwing manuals:

Console Operatcr's Guide	30000-90013
System Manager/System Supervisor Reference Manual	30000-90014
HP 7905A Disc Drive Installation and Service Manual	07905-90007
Model 7920A Disc Drive Operating and Service Manual	07920-90001
Model 7925 Disc Drive Installation Manual	07925-90902
HP 7925 Disc Drive User's Manual	07925-90901
HP 7925 Disc Drive Service Manual	07925-90903
Model 13037A/B Disc Controller Installation and Service Manual	13037-90006
Stand-Alone SLEUTH Diagnostic (D411A)	03000-90123
SDUPII Utility Program (D417A)	03000-90125

- As you read the instructions in this manual, keep in mind that some cf the responses shown in examples are only examples. For instance, DRT and logical device numbers may differ from one customer to the next depending on system configurations. For each system, you must refer to the System Support Log or the I/O device list to learn what your responses should be.

SPECIAL CONVENTIONS

RETURN key	Because it is standard operating procedure to end each line you type with a carriage return, this manual does not specifically say to press RETURN after each response. Also, in examples throughout this manual, the word return underlined indicates the RETURN key was pressed in response to a prompt.
uppercase	In this manual, all computer output to the console and all operator input from the keyboard appears in uppercase letters. You must respond in uppercase.
underlining	in examples distinguishes your input from computer output; your input is underlined.
%	A percent sign (%) preceding a number indicates the number is in octal notation.
control-H	To correct typing errors, press and hold the CNTL key while typing an H for each character you want to erase.
control-X	To cancel an entire line of typing before the final carriage return, press and hold the CNTL key while typing an X.
control-A or Switch Register switches 0 and 13 together	Either condition terminates SLEUTH07 and returns the SLEUTH utility to the input mode. The SLEUTH07 command list remains intact and you receive an input prompt with a statement number ten higher than the last statement number in SLEUTH07. In examples throughout this manual, >900 is shown as the next statement number. Note that changes to SLEUTH07 could cause this number to change; thus >900 is only an example.

MINI-OPERATING INSTRUCTIONS

SECTION I

This section summarizes the 7905A/7920A/7925A disc verification and pack formatting program, SLEUTH07. The section should be used for quick reference by persons familiar with this stand-alone SLEUTH program.

1-1. RUNNING SLEUTH07 (A SUMMARY)

- If you intend to use the customer's disc packs for running SLEUTH07, check that a SYSDUMP with a 0 dump date was performed. It should be noted that SLEUTH07 writes on all surfaces of the 7905 disc. Ensure that all surfaces have been backed up before running SLEUTH07.

- Obtain the disc controller DRT number from the System Support Log or from the list of I/O devices that was printed at SYSDUMP.

- Be sure the SLEUTH utility (D411) is present on a cold loadable I/O stand-alone magnetic tape.

- Check that you have a magnetic tape copy of SLEUTH07 for use when you issue the SLEUTH utility BATCH command.

- Shutdown the MPE Operating System. (Complete instructions are given in Section V of the Console Operator's Guide.)

- Check these switches:
  Disc drive READ ONLY switch OFF.
  Disc drive FORMAT switch ON if formatting is planned.
  System Control Panel PF/ARS Switch in the ENBL position.

- Cold load and run the SLEUTH utility as follows:

  a. Mount the I/O stand-alone tape reel on a magnetic tape drive. Select unit 0, place the tape at load point, and the unit on-line.

  b. Set %003006 in the Switch Register on the System Control Panel.

  c. Simultaneously press the ENABLE and LOAD buttons.

d. In the Switch Register, place the location SLEUTH occupies on the I/O stand-alone magnetic tape.

e. Press RUN.

f. Press RETURN on the console to start SLEUTH execution.

- Remove the I/O stand-alone tape reel and mount the tape reel which contains SLEUTH07. Place the the tape at load point, and the unit on-line.

- In response to the >10 prompt, use the BATCH command to load SLEUTH07 from the second magnetic tape.
  >10 BA E

- After the tape is read, you receive a SLEUTH prompt for input:
  >900 RUN

- Enter the DRT number of the disc controller:
  7905/7920/7925 VERIFIER, ENTER DRT #
  4

- Test the unit select switch:
  UNIT SELECT SWITCH TEST? (0=N, 1=Y)
  1
  ENTER UNIT#, SET SWITCH TO UNIT# ENTERED, PRESS RUN
  0

  The computer halts with %030377 displayed in the CIR. Set the UNIT SELECT Switch on the disc drive to position 0 and then press RUN on the System Control Panel. The test executes.

  ENTER UNIT#, SET SWITCH TO UNIT# ENTERED, PRESS RUN
  1

  Repeat switch tests until eight numbers have been tested.

- Testing proceeds as follows:

```
ENTER UNIT# TO BE TESTED
0
I NEED UNIT# ONE MORE TIME
0
FORMAT PACK? (0=N , 1=Y)
1
VERIFY PACK? (0=N , 1=Y)
1
VERIFY LONG PASS? (0=N , 1=Y)
0

BEGIN FORMAT
END FORMAT
BEGIN VERIFY
VERIFY PASS #
1
END VERIFY

BEGIN MAIN
END HEAD TEST
END TRACK SWITCH TEST
END WRITE/READ TEST
```

- The SLEUTH utility now prompts for more input: >900
  Halt the computer to end Sleuth execution.

- Repair the disc drive, if necessary.

- RELOAD the MPE Operating System.

1-2. ITEMS TO REMEMBER

- You may terminate SLEUTH07 execution with a control-A or by setting Switch Register switches 0 and 13. Following termination, you can: (1) type a RUN command to repeat the tests, (2) type any other SLEUTH command, or (3) press halt on the computer.

GENERAL INFORMATION

SECTION II

2-1. INTRODUCING THE 7905A/7920A/7925A VERIFIER, SLEUTH07

The SLEUTH07 program is used to diagnose disc drive problems. The disc drive may be a model 7905A, 7920A, or 7925A. Any combination of up to eight disc drives may be attached to the disc drive DRT. SLEUTH07 executes interactively with a user to:

- test whether the disc drive responds to unit numbers typed on the console.
- format and verify disc packs.
- test whether the drive heads can read and write both with and without track switching.

SLEUTH07 was developed using SLEUTH programming commands (refer to the program listing in Appendix A). SLEUTH (D411) is a stand-alone diagnostic utility used to generate and run test programs that isolate problems in the I/O section of an HP 3000 Series II/III Computer and its peripheral devices. In the case of SLEUTH07, we have developed a SLEUTH test program for you.

SLEUTH07 is supplied on the HP 3000 Master Installation Tape (MIT) in the field support account. Its fully qualified name is SLEUTH07.HP32230.SUPPORT.

The following steps summarize running SLEUTH07:

a. SLEUTH07 is copied to magnetic tape from the field support account using FCOPY (refer to paragraph B-1).

b. The SLEUTH utility (D411) is copied to an I/O stand-alone magnetic tape using SDUPII (refer to paragraph B-2).

c. The MPE Operating System is shut down (refer to steps 1 and 2 in paragraph 3-2).

d. The SLEUTH utility is cold loaded (refer to steps 3 through 9 in paragraph 3-2).

e. SLEUTH07 is loaded using the SLEUTH BATCH command (refer to steps 10 through 12 in paragraph 3-2).

f. The SLEUTH utility executes to perform the SLEUTH07 tests (steps 14 through 20 in paragraph 3-2).

g. The disc drive is repaired, if necessary. (Repair procedures are beyond the scope of this manual.)

h. The MPE Operating System is relcaded and restarted (refer to paragraph B-4).

2-2. Hardware Requirements

You can run this Verification Program on any minimum HP 3000 Series II/III Computer System so long as it includes an HP 7905A, 7920A, or 7925A disc drive.

The disc pack mounted on the drive for testing can be a system pack or a scratch pack. Note however, that all data stored on the disc (including data on the fixed surface of a 7905A) will be destroyed by the Verifier program.

2-3. Software Requirements

Before you can load and run SLEUTH07, the MPE Operating System must be shut down and the SLEUTH utility cold loaded from an I/O stand-alone magnetic tape. (Appendix B, paragraph B-2 reviews SDUPII, the utility used to produce cold loadable tapes.)

2-4. PROGRAM ORGANIZATION

The SLEUTH07 command list (printed in Appendix A) has four principal sections:

- The UNIT SELECT switch tests.
- The disc formatting utility.
- The disc surface verifier.
- The main write/read tests.

2-5. UNIT SELECT Switch Test

The test issues eight RECALIBRATE commands tc verify that the disc drive can respond tc unit numbers 0 through 7. The test prcmpts you tc type a unit number and then set the UNIT SELECT switch on the disc drive to the same number. When you press RUN on the computer, unit selecticn is verified.

After eight unit numbers have been tested, program execution ccntinues with the disc formatting section. Note that SLEUTH07 dces not keep track of which unit numbers you test, only that you enter a unit number, any number, eight times.

2-6. Disc Format Utility

This secticn of SLEUTH07 initializes and verifies the preamble, data field, and postamble in all sectors of each disc track, including spare tracks. The time required to format an entire drive varies with the drive as listed in Table 2-1.

Table 2-1. SLEUTH07 Functions/Completion Times

Function	Disc Drive Model Number		
	HP 7905*	HP 7920	HP 7925
Format	1 min,29 sec	5 min,1 sec	11 min,16 sec
Verify	1 min,56 sec	5 min,43sec	13 min,43 sec
Verify, Long Pass (3X Verify)	5 min,49 sec	17 min,8sec	41 min,9 sec

* Times listed are maximum, allcwing for worst-case rotational delay when switching between removable and fixed platters.

2-7. Disc Pack Verifier

This test writes data on the disc and then reads the same data tc check errors. You have two options:

A SHORT PASS tc write and read a wcrst-case data pattern on the entire disc, including spare tracks, in half track increments. The time required varies with the drive as listed in Table 2-1.

A LONG PASS tc write and read the same pattern in the same manner except that twc additional passes are made with the data pattern being shifted after each pass. A lcng pass takes three times as lcng tc run as a short pass. The time required varies with the drive as listed in Table 2-1.

2-8. Main Write/Read Tests

The write/read tests execute in three stages:

a. The first test verifies that all heads can write and read randcm portions of the disc.

b. The second test verifies that all heads can write and read with track switching. For example, 24 sectors of data are written to track 0, head 0, sectcr 45 of a 7920. After three sectcrs are written, the disc heads must be able tc switch tc track 0, head 1, sectcr 0 in order to write the remaining 21 sectcrs of data.

c. The third test writes and reads randcm portions of the disc with twc different data patterns of different lengths.

2-9. ERROR MESSAGES

During program execution, you can encounter programming error messages, general diagnostic messages, and test failure messages.

2-10. Program Error Messages

These messages result when you respond incorrectly tc prompts. The errors causing these messages are analcgcus tc programming syntax errors in other languages. After printing a program error message, SLEUTH prompts again with the same statement number so that you can retype your response. Program error messages and examples illustrating these messages are printed in Section IV of the SLEUTH Diagnostic Manual.

2-11. Diagnostic Messages

These messages report conditions that could terminate or otherwise affect SLEUTH execution. The messages are often combined with test failure messages tc report device status and cther ccnditions at the time of a failure. Diagnostic messages are listed in Table C-1 in Appendix C.

If you attempt to format a disc pack with the FORMAT switch OFF and/or the READ ONLY switch ON, you will receive a diagnostic message. The same is true if you attempt pack verification or write/read tests with the READ ONLY switch ON.

In either of these situations, SLEUTH07 prints a message and halts execution with halt number %17 (%030377 in the CIR display). To resume testing, simply change the appropriate switch positions and press RUN on the System Control Panel. If the condition is not corrected, SLEUTH07 displays >900 and returns to the input mode of SLEUTH.

2-12. Test Failure Messages

When SLEUTH detects an error during testing, it suppresses command execution and prints a message describing the error. Following the message, SLEUTH resumes execution at the point where it suspended.

SLEUTH-generated test failure messages are listed in Table C-2 in Appendix C. Message examples are given in Section IV of the SLEUTH Diagnostic Manual.

2-13. STATUS AND CONTROL WORDS

When SLEUTH reports a test failure, the message generally includes the current device status, the desired status, and other conditions as they were when the error occurred.

You can interpret these messages using the word format tables in Appendix D.

OPERATING PROCEDURES

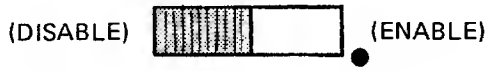
SECTION III

This section gives detailed instructions for loading and running SLEUTH07.

3-1. BEFORE YOU BEGIN

- Check these switch positions:

  The disc drive READ ONLY slide switch should be off. (In a 7905, the two platter protect switches should both be off.)



READ ONLY

  The disc drive FORMAT slide switch should be on if you intend to format a disc pack.

FORMAT

  The PF/ARS switch, located behind the System Control Panel face plate, should be set to the ENBL position.

- If you intend to use the customer's disc pack(s) for testing, check that a back-up magnetic tape copy of the entire system has been made. This copy should have been produced using a 0 dump date in the SYSDUMP command. If you must dump the system, refer to Appendix B, paragraph B-3 for mini-instructions.

- The SLEUTH utility (D411) must be loaded onto the downed computer system before you can load and run SLEUTH07. If the SLEUTH utility is not present on a cold loadable I/O standalone tape, use the SDUPII utility to produce such a tape. SDUPII instructions are summarized in Appendix B, paragraph B-2.

- After the SLEUTH utility has been loaded, the SLEUTH07 command list must also be loaded from a second magnetic tape. The second tape should be produced using the procedures in paragraph B-1.

- When SLEUTH07 executes, it asks for the Device Reference Table (DRT) number of the disc controller. You can obtain this number from the System Support Log or from the I/O device list which was printed during the SYSDUMP.

3-2. LOADING AND RUNNING SLEUTH07

1. Be sure all users have logged off the system.

2. At the system console:

   a. LOGOFF any sessions still logged-on.
   b. Use the RECALL command to check for outstanding allocation messages.
   c. REPLY to all outstanding messages.
   d. SHUTDOWN the system.

   Detailed instructions for performing steps a through d are given in Section V of the Console Operator's Guide.

3. Mount the I/O stand-alone tape containing the SLEUTH utility on the magnetic tape drive. Select unit 0.

4. Press LOAD and then ON LINE.

5. On the System Control Panel, enter %003006 into the Switch Register.

6. Simultaneously, press ENABLE and LOAD. The tape moves as a portion is read.

7. Set the Switch Register to the location SLEUTH occupies on the magnetic tape. For example, if SLEUTH is the first file on the tape, enter %000001; if it is the tenth file, enter %000012.

8. Press RUN. The tape moves forward as additional tape is read and then rewinds to the load point.

9. Press the RETURN key on the system console. SLEUTH begins execution with the message:

```
D1 SLEUTH 3000 (HP D411A.XX.Y)
 (C) COPYRIGHT HEWLETT-PACKARD COMPANY 1978
>10                        (XX.Y = Current version of SLEUTH)
```

   The >10 prompt indicates SLEUTH is awaiting input from you.

10. At the magnetic tape drive, remove the I/O stand-alone tape and mount the SLEUTH07 tape.

11. Press LOAD and then ON LINE.

12. At the system ccnsole, type:

    >10 BA E

13. After the tape has been read, SLEUTH again prompts for input

    >900

    Note from the statement number in the prompt that the command list was lcaded successfully. (Remember that SLEUTH prompts with a statement number ten higher than the last statement in the command list.) If the statement number is not displayed, it can be obtained by entering the SLEUTH command AUTO.

    In response, type RUN.

14. The next prompt asks for the Device Reference Table (DRT) number of the disc controller:

    7905/7920/7925 VERIFIER, ENTER DRT#

    Respond with the DRT number taken from the System Suppcrt Log or the list of I/O devices.

15. Now testing begins with the first of a series of prompts:

    UNIT SELECT SWITCH TEST? (0=N, 1=Y)

    If you plan tc skip over the first test (described in paragraph 2-5), respond 0 and proceed to step 16.

    If ycu respond 1 to start this test, the following message is printed:

    ENTER UNIT#, SET SWITCH TO UNIT# ENTERED, PRESS RUN

    a. At the system ccnsole, type a unit number (0 through 7) followed by a carriage return. When you press the RETURN key, the computer halts with halt %17 (%030377 in the CIR display).

    b. At the disc drive, set the UNIT SELECT switch tc the same number you typed at the console.

    c. Press RUN on the System Control Panel.

If a test succeeds, the ENTER UNIT# prompt is repeated. If a test fails, you receive an appropriate message and then the prompt is repeated. In either case, once a tctal of eight unit numbers have been tested, program execution proceeds automatically to the format and verification sections.

16. Next, you are asked for the unit number of the drive you want to test.

    ENTER UNIT# TO BE TESTED

    Note the position of the UNIT SELECT switch on the disc drive that you plan to test. The number you type must be the same as the unit selected.

17. To configure SLEUTH07 properly, the unit number must be entered again.

    I NEED UNIT# ONE MORE TIME

    To ensure that errcrs do not occur, make sure that the responses to steps 16 and 17 are identical.

18. Before disc drive testing begins, you can request disc pack formatting.

    FORMAT PACK? (0=N, 1=Y)

    To skip the formatting procedure, respond 0. Otherwise, type a 1. The time required to format an entire drive varies with the drive as listed in Table 2-1.

19. Next you can request that the disc surfaces be checked for damage:

    VERIFY PACK? (0=N, 1=Y)

    If ycu want tc skip these tests, respond 0. If you respond with a 1, you receive still ancther prompt:

    VERIFY, LONG PASS? (0=N, 1=Y)

    Responding 0 causes SLEUTH07 to perform the short test described in paragraph 2-7. The time required to run the test varies with the drive as listed in Table 2-1.

    Respcnding 1 causes SLEUTH07 to perform the long test. This test runs three times as long as the short test. Refer tc Table 2-1.

20. You have now supplied all of the information SLEUTH07 needs. Execution begins with disc formatting (if formatting was requested), continues with a short or long pass check of the pack surfaces (if checking was requested), and completes with the main Write/Read tests described in paragraph 2-8. The program tells you what is happening with the following messages:

```
BEGIN FORMAT              (if formatting was requested)
END FORMAT

BEGIN VERIFY              (if verifying was requested)
VERIFY PASS #                (short or long pass)
1
VERIFY PASS #                (long pass only)
2
VERIFY PASS #                (long pass only)
3
END VERIFY

BEGIN MAIN
END HEAD TEST
END TRACK SWITCH TEST
END WRITE/READ TEST
```

If a failure occurs, an appropriate message is printed and execution continues automatically.

21. Finally, after the END WRITE/READ TEST message signals that all tests are complete, the SLEUTH utility returns to the input mode and prints:

```
>900
```

At this time you can type RUN to repeat the entire sequence, type any other SLEUTH command, or halt the computer.

SLEUTH07 LISTING

APPENDIX A

A-1. INTRODUCTION

This version of SLEUTH07 performs the same tests as earlier versions, but is capable of testing any current disc drive (7905, 7920, and 7925) controlled by the 13037 Disc Controller.

The three disc drives differ only in their address space (number of cylinders and heads, and numbers of sectors per track). Their data rates and sector formats are all the same. (Refer to any disc drive manual for additional information.) The 13037 Disc Controller must be aware of these difference in order to implement some of its features. Therefore, each drive model has a unique four-bit Drive Type field (Table D-3) available to the controller and to the user. SLEUTH07 retrieves this field from the unit number selected by the user and uses it to configure itself so that the entire disc is tested, regardless of which model it happens to be.

A-2. SLEUTH07 STRUCTURE

SLEUTH07 has four data buffers (AA, BB, CC, and DD), three disc address arrays (CY, HD, and SC), and one self-contained SIO program (ST) which reads controller and drive status into a two-word status register array (SR). In addition, there are the following variables:

a. The three disc address arrays (CY, HD, and SC) contain the maximum cylinder, head, and sector addresses, respectively, of the various drive types. For example, the 7920 is drive type 1. Therefore, CY(1) contains 822; the maximum cylinder address for a 7920. Similarly, HD(1) contains 4, and SC(1) contains 47.

b. The SIO program (ST) and buffer (SR) fetch the drive type field from the disc drive. The drive type is stored in the index variable T (for Type), and is used to access the proper elements of CY, HD, and SC. A SLEUTH limitation requires asking for the unit number twice. The first time configures the SLEUTH device table. The unit number is then no longer available to SLEUTH07. The second time, SLEUTH07 configures the ST SIO program to obtain the drive type.

c. SLEUTH read and write commands carry an implied length; the length of the buffer used in the transfer. Therefore, in order to implement half-track reads and writes, two sets of buffers must be used (one half-track equals 4096 words for a 7925 and 3072 words for the 7905 and 7920 drives). There-

fore, data buffers AA and BB are 3072 words long, and buffers CC and DD are 4096 words long. Buffers AA and CC are write buffers containing a worst-case data pattern. Buffers BB and DD are read buffers to be compared with buffers AA and CC, respectively.

d. Variables:

C,H,S	Used for cylinder, head, and sector variables for loop control.
T	Drive type variable obtained from the drive. Index to CY, HD, and SC.
P	Pass variable; used to control number of passes through the Verify section of SLEUTH07.
A	Used for replies (answers) to user prompts.
I,J,K,N	Loop variables.
X,Y,Z	Program control variables. X = format Y = verify. Z = verify, long pass.
D,E,F	Temporaries.

A-3. SLEUTH07 EXECUTION

As an aid toward better understanding of SLEUTH07 execution, Table A-1 contains a list of pertinent program step numbers and an explanation of the program functions they perform. The complete SLEUTH07 listing is contained in paragraph A-4.

Table A-1. SLEUTH07 Step Descriptions

Listing Step No.	Description
5-25	Initialization; obtain DRT#.
30-90	Unit select switch test.
95-110	Put unit number in SLEUTH device table.
115-145	Obtain drive type field from drive, based on unit number entered by user.
150-160	Set the T, C, and H variables. The S variable is set tc different values during SLEUTH07 execution.
165-195	Get user options fcr SLEUTH07 execution.
205-405	FORMAT section. Detailed outline follows.
205-255	Check for proper setting of Format and Read Only switches.
260-265	Set S to the sectcr address of the seccnd half track.
270-320	Initialize one track each time through the inner (J) loop. After each I loop, one cylinder has been initialized. Lines 290-295 are used only for the 7925. Lines 305-310 are used only for the 7905 and 7920 drives.
325-400	Verify, in cylinder mode, the previously formatted disc. Verify a cylinder at a time. The number of sectcrs in a cylinder is calculated in step 335.
360-400	If an error occurred during verify, the address printed is that cf the start of the verify. These statements obtain and print the actual address where the errcr was detected.
410-455	Check for the proper condition of the Read Only switch. This test is required cnly if the FORMAT option is bypassed.
460-640	VERIFY section. Detailed outline follows.

Table A-1. SLEUTH07 Step Descriptions (Continued)

Listing Step No.	Description
465-475	Use user-entered option to decide whether to verify one pass or three.
485-490	Change the pattern in each write buffer for each pass.
495-620	Write, then read the first half track. If any read errors, compare the read and write buffers. Display the first three miscomparisons. Repeat the above for the second half track. Steps 510-560 are used only for the 7925. Steps 565-610 are used only for the 7905 and 7920 drives. After each J loop, one track has been verified. After each I loop, one cylinder has been verified.
625-635	Loop control; number of verify passes.
645-865	MAIN TEST section. Detailed outline (divided into three subsections) follows.
650-710	Head Test. For each head, choose a random cylinder and sector. Write, read, and compare 24 sectors, displaying first three miscomparisons. Repeat the entire test 40 times.
715-760	Track Switch Test. Set sector variable to last sector address -2. For each head, choose a random cylinder. In cylinder mode with auto incremental seek enabled; write, read, and compare 24 sectors, displaying first three miscomparisons. Choice of starting sector address ensures testing track switching and, for last head, cylinder switching (automatic seek). Repeat entire test 40 times.
765-865	Main Write/Read Test. Choose a random cylinder, head, and sector address. Seek, write, random seek, seek and read 24 sectors. If any read errors, compare the read and write buffers. Display the first three miscomparisons. Repeat the above at the same address, but with 32 sectors. Repeat the entire test 250 times, changing the write buffer patterns for each test.

A-4. PROGRAM LISTING

```
  5 DEV 0,4,11,999,0
  5 DB AA,3072,W
1(%155555),1(%133333),1(%066666)
  5 DB BB,3072,0
  5 DB CC,4096,W
1(%155555),1(%133333),1(%066666)
  5 DB DD,4096,0
  5 DB CY,4,W
1(410),1(822),1(410),1(822)
  5 DB HD,4,W
1(3),1(4),1(2),1(8)
  5 DB SC,4,W
1(47),1(47),1(47),1(63)
  5 DB SR,2,0
  5 NAME ST
  5 CONT 1,%1400
  5 READ SR
  5 ENDS,I
  5 PUT "7905/7920/7925 VERIFIER, ENTER DRT#"
 10 GET 0,D
 15 MC 0
 20 TIO 0
 25 GO 5,%100000,7
 30 PUT "UNIT SELECT SWITCH TEST? (0=N,1=Y)"
 35 GET A
 40 IF A=0 THEN 95
 45 FOR I=0 TO 7
 50 PUT "ENTER UNIT#, SET SWITCH TO UNIT# ENTERED, PRESS RUN"
 55 GET 0,U
 60 NOPR
 65 HALT
 70 LOOP 70,200
 75 PR
 80 RC 0
 85 GO 50,%117400,7
 90 NEXT I
 95 PUT "ENTER UNIT# TO BE TESTED"
100 GET 0,U
105 RC 0
110 GO 95,%117400,7
115 PUT "I NEED UNIT# ONE MORE TIME"
120 GET A
125 ACB D=ST(1)
130 LET D=D AND %177770 OR A
135 ACB ST(1)=D
140 SIO 0,ST,1,10,%100000,7
145 ACB D=SR(1)
150 LET T=D LSR 9 AND %17
155 ACB C=CY(T)
160 ACB H=HD(T)
```

A-4. PROGRAM LISTING (cont)

```
165 PUT "FORMAT PACK? (0=N,1=Y)"
170 GET X
175 PUT "VERIFY PACK? (0=N,1=Y)"
180 GET Y
185 IF Y=0 THEN 200
190 PUT "VERIFY, LONG PASS? (0=N,1=Y)"
195 GET Z
200 IF X=0 THEN 410
205 PUT "BEGIN FORMAT"
210 SEEK 0
215 FOR I=0 TO 1
220 IDI 0,AA,3,N
225 GO 235,%100000,7
230 GOTO 260
235 IF I=1 THEN 875
240 PUT "DISC IS READ ONLY OR FORMAT SWITCH OFF"
245 PUT "CORRECT CONDITION, PRESS RUN"
250 HALT
255 NEXT I
260 ACB S=SC(T)
265 LET S=(S+1)/2
270 FOR I=0 TO C
275 FOR J=0 TO H
280 SEEK 0,I,J,0
285 IF T<>3 THEN 305
290 IDI 0,CC
295 ID 0,CC,2,N,I,J,S
300 GOTO 315
305 IDI 0,AA
310 ID 0,AA,2,N,I,J,S
315 NEXT J
320 NEXT I
325 ACB D=HD(T)
330 ACB E=SC(T)
335 LET S=(D+1)*(E+1)
340 FOR I=0 TO C
345 SEEK 0,I,0,0
346 SFM 0,2
350 VERI 0,S
355 LET D=TIO AND %177770
360 IF D=%100000 THEN 400
365 SS
370 RDA 0
375 ES
380 DISP 0,D
400 NEXT I
405 PUT "END FORMAT"
410 SEEK 0
415 FOR I=0 TO 1
420 WDI 0,AA,7
425 GO 435,%100000,7
```

A-4. PROGRAM LISTING (cont)

```
430 GOTO 455
435 IF I=1 THEN 875
440 PUT "DISC IS READ ONLY, CORRECT CONDITION, PRESS RUN"
445 HALT
450 NEXT I
455 IF Y=0 THEN 645
460 PUT "BEGIN VERIFY"
465 LET P=1
470 IF Z=0 THEN 480
475 LET P=3
480 FOR N=1 TO P
485 CHB AA,S
490 CHB CC,S
495 FOR I=0 TO C
500 FOR J=0 TO H
505 IF T<>3 THEN 565
510 SKWD 0,CC,6,I,J,0
515 SKRD 0,DD,6,I,J,0
520 GO 530,%100000,7
525 GOTO 535
530 CB 0,CC,DD,3
535 SKWD 0,CC,6,I,J,32
540 SKRD 0,DD,6,I,J,32
545 GO 555,%100000,7
550 GOTO 615
555 CB 0,CC,DD,3
560 GOTO 615
565 SKWD 0,AA,6,I,J,0
570 SKRD 0,BB,6,I,J,0
575 GO 585,%100000,7
580 GOTO 590
585 CB 0,AA,BB,3
590 SKWD 0,AA,6,I,J,24
595 SKRD 0,BB,6,I,J,24
600 GO 610,%100000,7
605 GOTO 615
610 CB 0,AA,BB,3
615 NEXT J
620 NEXT I
625 PUT "VERIFY, PASS#"
630 LIST N
635 NEXT N
640 PUT "END VERIFY"
645 PUT "BEGIN MAIN"
650 RC 0
655 FOR J=0 TO H
660 RAND D
665 LET I=D MOD (C+1)
670 ACB S=SC(T)
675 RAND D
```

A-4. PROGRAM LISTING (cont)

```
680 LET K=D MOD S
685 SKWD 0,AA,7,I,J,K
690 SKRD 0,BB,7,I,J,K
695 CB 0,AA,BB,3
700 NEXT J
705 LOOP 655,40
710 PUT "END HEAD TEST"
715 LET S=S-2
720 FOR J=0 TO H
725 RAND D
730 LET I=D MOD (C+1)
735 SKWD 0,CC,7,I,J,S
740 SKRD 0,DD,7,I,J,S
745 CB 0,CC,DD,3
750 NEXT J
755 LOOP 720,40
760 PUT "END TRACK SWITCH TEST"
765 RAND D
770 LET I=D MOD (C+1)
775 LET J=D MOD (H+1)
780 LET K=D MOD (S+2)
785 SKWD 0,AA,7,I,J,K
790 RS 0
795 SKRD 0,BB,7,I,J,K
800 GO 810,%100000,7
805 GOTO 815
810 CB 0,AA,BB,3
815 RS 0
820 SKWD 0,CC,7,I,J,K
825 RS 0
830 SKRD 0,DD,7,I,J,K
835 GO 845,%100000,7
840 GOTO 850
845 CB 0,CC,DD,3
850 CHB AA,S
855 CHB CC,R
860 LOOP 765,250
865 PUT "END WRITE/READ TEST"
870 GOTO 890
875 RQST 0
880 DISP 0,R
885 PUT "STATUS ERROR"
890 END
```

MPE ACTIVITIES

APPENDIX B

This appendix summarizes MPE system backup and restart procedures. Although the customer is normally responsible for dumping and reloading the operating system, we provide abbreviated instructions in case you must assume these responsibilities.

In addition, this appendix includes instructions for producing the magnetic tapes which you must use when loading the SLEUTH utility and SLEUTH07 onto a shutdown HP 3000 Series II/III Computer System.

As you read the following instructions, keep in mind that some of the responses shown are examples only. For instance, DRT and logical device numbers may differ from one customer to the next depending on system configurations. For each system, you must refer to the System Support Log or the I/O device list to learn what your responses should be.

B-1. COPYING SLEUTH07 TO MAGNETIC TAPE USING FCOPY

SLEUTH07 resides on disc in the field support account. It must be copied to magnetic tape for reloading after the MPE Operating System is shutdown. Use the following procedure to produce such a tape.

At a tape drive, mount a fresh tape reel. Place the tape at load point and the device on-line.

At the System Console:

```
control-A
=SESSION
:HELLO FIELD.SUPPORT,HP32230
 HP 3000 IIB, WED, MAR 29, 1978, 3:42 PM
:FILE T;DEV=TAPE;REC=40,1,F,ASCII
:RUN FCOPY.PUB.SYS
HP32212A.1.02 FILE COPIER (C) HEWLETT-PACKARD CO.

>FROM=SLEUTH07;TO=*T

?I/O15:26/#S532/23/LDEV# FOR "T" ON TAPE (NUM)
control-A
=REPLY 23,7
```

```
EOF FOUND IN FROMFILE AFTER RECORD XXX
XXX RECORDS PROCESSED *** 0 ERRORS

>EXIT
 END OF PROGRAM
:BYE
```

You now have a magnetic tape which can be loaded after you load the SLEUTH utility and issue the BA E command.

B-2. CREATING A SLEUTH STAND-ALONE TAPE USING SDUPII

Before you can actually run the SLEUTH utility and subsequently load and run SLEUTH07, SLEUTH must be copied from the field support account to an I/O stand-alone diagnostic tape for cold loading on an HP 3000 Series II/III Computer. Cold loadable tapes are produced using the SDUPII utility which also resides in the field support account.

Use the following abbreviated instructions to make a stand-alone copy of SLEUTH. (Programs are called "stand-alone" when they can be loaded and run without the MPE Operating System.)

Mount a fresh tape on the magnetic the tape drive. Press the LOAD and ON LINE buttons.

At a terminal:

```
return
:HELLO FIELD.SUPPORT,HP32230
:RUN SDUPII.PUB.SYS

3000 DIAGNOSTIC UTILITY PROGRAM (SDUPII) D417A.00.00
  (C)COPYRIGHT HEWLETT-PACKARD COMPANY 1976.

DO YOU WANT INSTRUCTIONS?
ANSWER 'YES' OR 'NO'  NO

INPUT DIAGNOSTIC TYPE  2

PROGRAM NAME?  PD411A

PROGRAM NAME?  /

INPUT DRT OF THE LINE PRINTER
A CARRIAGE RETURN ASSUMES NO LINE PRINTER  %10
```

```
INPUT LINE PRINTER TYPE
MODELS-2607A, 2613A, 2617A, AND 2618A ARE TYPE 0
MODELS-2610A AND 2614A ARE TYPE 1
A CARRIAGE RETURN ASSUMES TYPE=0
1

MOUNT TAPE ON TAPE UNIT
TAPE REQUEST HAS BEEN ISSUED
OPERATOR MUST NOW REPLY TO REQUEST
```

At the system ccnsole, use the REPLY command to assign the lcgical device number (ldv = magnetic tape unit# + 7).

```
control-A
=REPLY 23,7
```

The SLEUTH utility is copied tc tape and a map is printed. After copying is ccmplete, you receive the END OF PROGRAM message.

B-3. DUMPING AN MPE OPERATING SYSTEM

For complete instructions on dumping a system, refer tc Section VI in the System Manager/System Supervisor Manual and to Section V in the Console Operator's Manual. A summary follows.

Mount a fresh tape on a magnetic tape drive. Place the tape at lcad pcint and the unit on-line.

At a terminal:

```
return
:HELLO MANAGER.SYS
:FILE TAPE;DEV=TAPE
:FILE LP;DEV=LP
:SYSDUMP *TAPE,*LP
 ANY CHANGES? YES
 SYSTEM ID = HP32002B.00.00?  return
 MEMORY SIZE = 128?  return
 I/O CONFIGURATION CHANGES? YES
 LIST I/O DEVICES? YES
```

> This list is important because you need to know the DRT number of the disc drive you want tc test with SLEUTH07. If you already know the DRT number, respond NO to the ANY CHANGES? prompt and you will immediately receive the ENTER DUMP DATE? prompt.

Once the list of I/O devices has been printed, you can respond to subsequent prompts with a carriage return until the dump date prompt.

```
ENTER DUMP DATE? 0
ENTER DUMP FILE SUBSETS    return
LIST FILES DUMPED? NO
```

At the system console, use the REPLY command to assign the logical device number of the magnetic tape drive (ldn = unit# + 7).

```
control-A
=REPLY 23,7
```

Once this is done, the entire system is copied to tape(s).

After dumping is complete, you receive the message:

```
END OF SUBSYSTEM
```

Now you can shutdown the system.

B-4. RELOADING THE MPE OPERATING SYSTEM

Use the following instructions for doing a simple reload from backup magnetic tapes. Refer to Sections IV and V of the Console Operator's Guide for additional information about the options available when restarting the MPE Operating System.

a. Mount the first SYSDUMP tape reel on the magnetic tape drive. Select unit 0. Press LOAD and ON LINE.

b. At the System Control Panel, place %003006 in the Switch Register.

c. Simultaneously, press the ENABLE and LOAD switches. A portion of the tape is read. When tape movement stops, the RUN light should turn off (the SYSTEM HALT light should also be off).

d. Press RUN. The RUN light should turn on.

e. At the console, press the RETURN key. If nothing happens, reset the terminal and press RETURN again.

f. Answer the prompts as follows:

```
WHICH OPTION <COLDSTART/RELOAD/UPDATE>? RELOAD
WHICH OPTION <SPREAD/COMPACT/RESTORE/ACCOUNTS/NULL>? return
LOAD MAP? return
ANY CHANGES? return
```

If you used a scratch pack for testing, prompts concerning the disc volume label are omitted and loading begins immediately.

If you did not use a scratch disc pack for the SLEUTH07 tests, the next prompts will ask questions about the Volume Table. This happens because the table is destroyed during testing. The questions are part of the Initiator-User Dialogue which is discussed in Section V of the System Manager/System Supervisor Manual. After you supply information for the disc label, loading begins.

Once loading is complete (this could take up tc four hours if a multi-reel SYSDUMP was done), prompting continues:

```
DATE? (M/D/Y)  3/29/78

TIME? (HH:MM)  16:35

WED, MAR 29,1978,  4:35 PM?  return

*WELCOME*
```

ERROR MESSAGES

APPENDIX C

You may encounter the messages listed in the following tables:

- Table C-1. Diagnostic Messages
- Table C-2. Test Failure Messages

In addition to the messages listed in tables C-1 and C-2, you may receive SLEUTH-generated programming error messages. These are listed in the SLEUTH Diagnostic Manual.

Table C-1. Diagnostic Messages

MESSAGE NUMBER	DIAGNOSTIC MESSAGE	COMMENTS
D1	SLEUTH 3000 (HP D411A.00.0)	Standard SLEUTH message.
D2	PASS COUNTER EQUALS xxxxxx	Within the program loop, a BUMP P (bump pass counter) command incremented the counter and displayed this message.
D3	LAST TIO STATUS IS x xxx xxx xxx xxx xxx	The test I/O (TIO) command obtained the status of a logical device. That status was returned by a STAT T command.
D4	LAST CCG STATUS IS x xxx xxx xxx xxx xxx	This message reports the status of Condition Code G. Refer to the System Reference Manual for information about CCG.
D5	LAST SIO PROGRAM EXECUTED IS xxxxxx: xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx	The message includes the address of the most recently executed SIO program and the words in the program. A D5 message is always combined with a D6 message.

Table C-1. Diagnostic Messages (Continued)

MESSAGE NUMBER	DIAGNOSTIC MESSAGE	COMMENTS
D6	SIO PROGRAM POINTER EQUALS xxxxxx	Following a data transfer error, xxxxxx indicates the last word transferred in the SIO sequence. (Refer to the D5 message.)
D7	NO CURRENT SIO PROGRAM	A DUMP command requested an SIO program dump but the last SIO program is not available.
D8	**POWER FAIL**	Self explanatory.
D9	LAST SYNDROME IS	The combined commands Request Syndrome (RSYN) and Display Syndrome (DISP Y) obtain and display the last error syndrome from the disc controller. It should be noted that RSYN should not be used unless a Possibly Correctable Data Error status (%074 in Table D-1) has been returned.
D10	REQUESTED STATUS IS x xxx xxx xxx xxx xxx x xxx xxx xxx xxx xxx	A display command (DISP R) returns two words of status: word 1 and word 2. Refer to Appendix D for word formats.
D11	SECTOR ADDRESS IS xxxxxx	The combined commands Request Sector Address (RSA) and Display Sector Address (DISP S) obtain and display the sector address which was passing under the disc drive heads at the time the RSA command was executed.

Table C-2. Test Failure Messages

MESSAGE NUMBER	DIAGNOSTIC MESSAGE	COMMENTS
E1	xxxx FAILED IN STEP XXX, CONDITION CODE=xxx	During SLEUTH execution, the CPU issued an SIO program command but the disc drive failed to respond. CCG = Device Not Busy CCE = Responding Device Controller CCL = Non-responding Device Contrcller
E2	xxxx FAILED IN STEP xxx	The disc drive failed to respond to the xxxx command in step xxx.
E3 E4	STATUS IS x xxx xxx xxx xxx xxx SHOULD BE x xxx xxx xxx xxx xxx	The device status returned as the result of a command did not correspond to the status expected by SLEUTH.
E5	CYLINDER=xxx, SECTOR=xx, HEAD=xx	A data transfer failed. The message indicates the disc area or the head that caused the problem. Also displayed as a result of the DISP D command.
E6 E7	DATA WORD xxxx IS x xxx xxx xxx xxx xxx SHOULD BE x xxx xxx xxx xxx xxx	An error occurred during a data transfer. The data word xxxx is currently the number in message E6. SLEUTH expected the number in E7.
E9	MISSING INTERRUPT IN STEP xxx	The CPU issued the command in step xxx but the controller failed to respond.

Table C-2. Test Failure Messages (Continued)

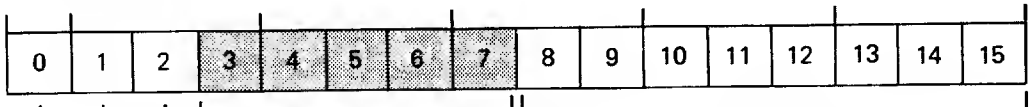
MESSAGE NUMBER	DIAGNOSTIC MESSAGE	COMMENTS
E10	UNEXPECTED INTERRUPT FROM DEVICE xxx in STEP xxx	While SLEUTH was testing one device, it received an interrupt from another device (xxx). The message includes the DRT number of the second device.
E11 E5	ADDRESS READ IS xxxxxx, xxxxxx CYLINDER=xxx, SECTOR=xx, HEAD=xx	The combined commands, Request Disc Address (RDA) and Display Disc Address (DISP) obtained the last address from the disc controller. The first number in E11 is the logical cylinder address and the second is the head and sector logical address.
E12	CHANNEL IS xx, SHOULD BE xx	
E13	ERROR COUNT ON LOGICAL UNIT x EXPIRED	The logical unit x has incurred more errors than the Device command (DEV) allotted.
E14	BUFFER IS NOT CORRECTABLE	A non-correctable error has occurred.
E15	RIO STATUS IS x xxx xxx xxx xxx xxx	SLEUTH issued a read I/O which failed. The RIO status is returned by an automatic TIO command.

STATUS AND CONTROL WORDS

APPENDIX D

Table D-1. Status Word Returned by TIO, SENSE, and END Commands

STATUS WORD (TIO, SENSE, END)



SIO READY — TEST MODE — INTERRUPT REQUEST — S1 ENCODED TERMINATION STATUS — UNIT NUMBER

S1	TERMINATION STATUS	OCTAL CODE*
0 000 0	= Normal completion	000
0 000 1	= Illegal opcode	004
0 001 0	= Wakeup (not an error)	010
0 011 1	= Cylinder compare error	034
0 100 0	= Uncorrectable data error	040
0 100 1	= Head-sector compare error	044
0 101 0	= I/O program error	050
0 110 0	= End of cylinder	060
0 111 0	= Overrun	070
0 111 1	= Possibly correctable data error	074
1 000 0	= Illegal access to spare track	100
1 000 1	= Defective track	104
1 100 0	= Access not ready during data operation	110
1 001 1	= Status word 2	114
1 110 0	= Attempt to write on protected track	130
1 011 1	= Unit unavailable	134
1 111 1	= Drive attention (seek complete, head load/unload)	174

OCTAL CODE*	TERMINATION STATUS	COMMENTS/ACTION
000	Normal Completion	A command executed without error.
004	Illegal Opcode	A command was not a disc controller command. Refer to the instruction set in the 13037A/B Disc Controller Installation and Service Manual for valid commands.
010	Wakeup (not an error)	Status returned in response to a Wakeup command when the requested drive is available.
034	Cylinder Compare Error	The address of the sector being read from or written to does not compare as expected with the address of the prior sector.
040	Uncorrectable Data Error	During a read operation, a data error was detected. Error correction circuits could not recover.

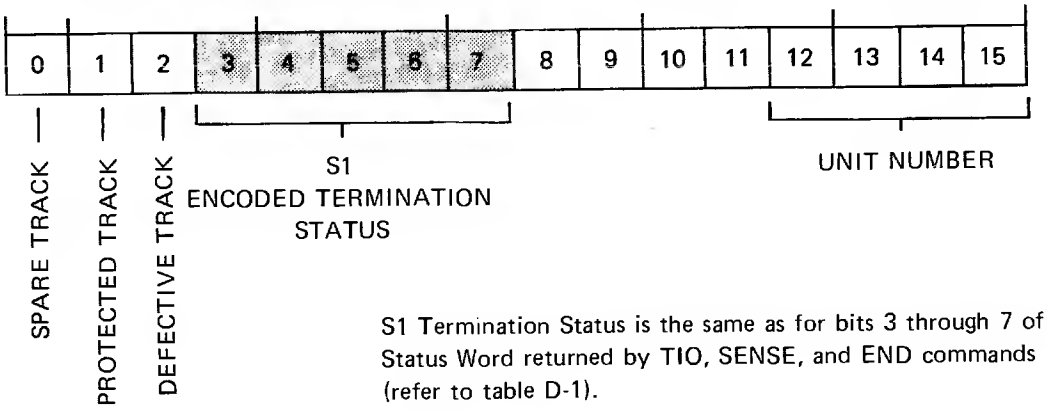
* The Octal Code is the octal representation of bits 1 through 9 assuming bits 1, 2, 8, and 9 are clear (set to zeros).

Table D-1. Status Word Returned by TIO, SENSE, and END Commands (Continued)

OCTAL CODE*	TERMINATION STATUS	COMMENTS/ACTION
044	Head-Sector Compare Error	Similar to Cylinder Compare Error (Code 034). Head and/or sector address field of disc sector does not compare with the corresponding field in the controller's Head-Sector Address Register.
050	I/O Program Error	The CPU detected an abnormal channel operation and notified the controller. The controller then interrupted the CPU with the status. (Example: A read command was transmitted to the controller but the channel is programmed to write.)
060	End of Cylinder	A data transfer required going beyond the end of the current logical cylinder but the instruction file mask does not allow the controller to automatically seek to the next cylinder.
070	Overrun	The instantaneous data transfer rate of the controller exceeds that of the CPU-IOP combination. The condition was detected by the CPU-IOP (read) and/or the controller (write).
074	Possibly Correctable Data Error	A data error was detected by the error correction circuits. The Request Syndrome command may be used to possibly obtain correction information.
100	Illegal Access to Spare Track	An error resulted from attempting to seek to a spared track.
104	Defective Track	During pack verification, the test detected that the D-bit is currently set (indicating the track is defective).
110	Access Not Ready During Data Operation	During a data transfer, the heads moved off track.
114	Status Word Two Error	The disc drive was unable to complete a command issued by the controller. Refer to table D-3.
130	Attempt to Write on Protected Track	While verifying a pack, the P-bit was found to be set (protect) during a write operation.
134	Unit Unavailable	The unit field of the command word is greater than %13 or the requested unit is allocated to another CPU (multi-CPU mode only).
174	Drive Attention	The controller generated an interrupt to the CPU because the drive needs attention. For example, a seek completed or a drive fault occurred.

Table D-2. Status Word One Returned by REQUEST STATUS Command

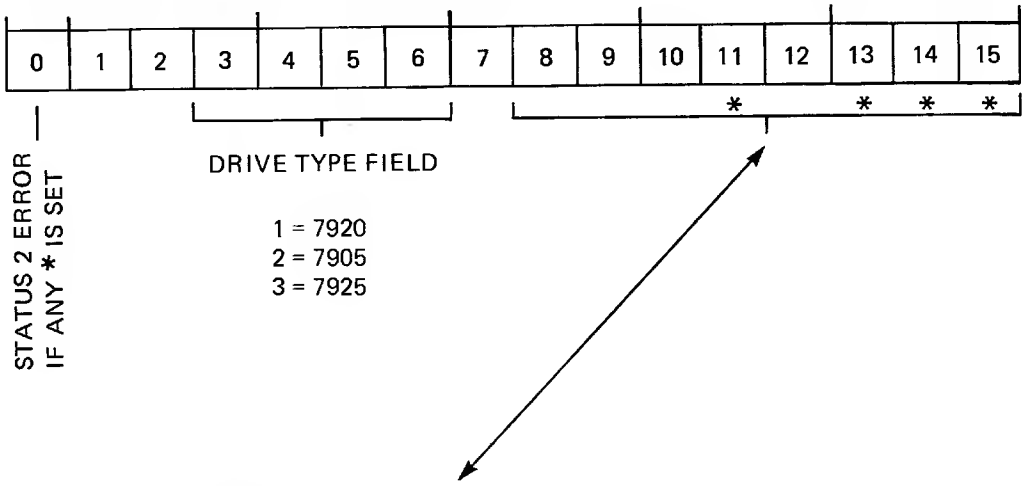
STATUS WORD ONE (First Status Word Returned by the REQUEST STATUS Command)



S1 Termination Status is the same as for bits 3 through 7 of the Status Word returned by TIO, SENSE, and END commands (refer to table D-1).

Table D-3. Status Word Twc Returned by REQUEST STATUS Command

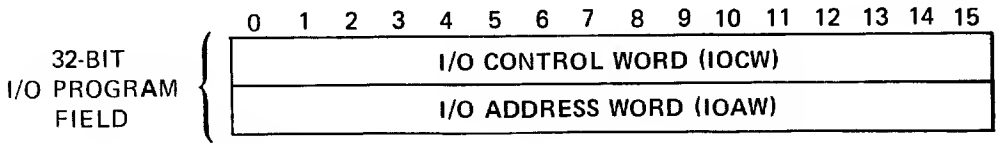
STATUS WORD TWO (Second Status Word Returned by the REQUEST STATUS Command)



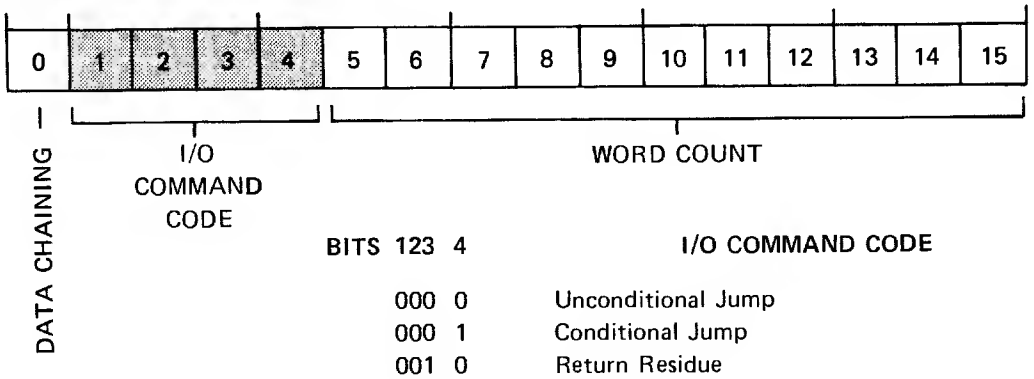
BIT	MEANING WHEN SET (1)
8	ATTENTION – The disc drive needs attention.
9	PROTECTED – The READ ONLY switch is set to protected position.
10	FORMAT – The FORMAT switch is set to the format position.
11*	FAULT – A read/write or servo fault was detected. (Destructive faults cause the heads to unload.) See the Fault Table (Table D-5).
12	FIRST STATUS - The disc drive has gone from "not ready" to "ready".
13*	SEEK CHECK - A SEEK was attempted while the drive was still processing the previous SEEK command, or, an illegal address (C/H/S) was sent to the drive.
14*	DRIVE NOT READY – Heads are not loaded (over the disc).
15*	DRIVE BUSY – Heads are not positioned and settled over a valid track.

* Bit 0 will always be set if bit 11, 13, 14, or 15 is set (1).

Table D-4. I/O Program Field



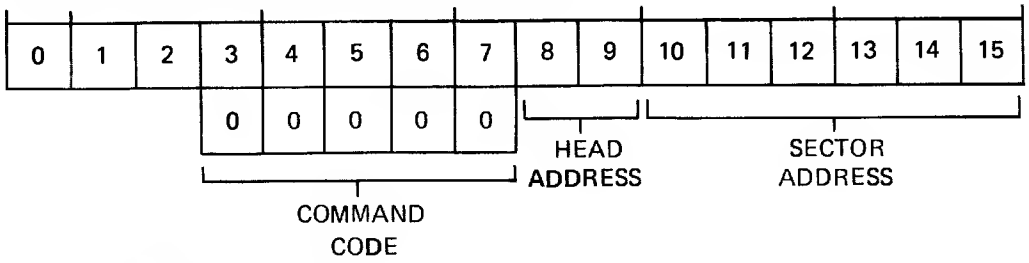
IOCW FORMAT



BITS 123	4	I/O COMMAND CODE
000	0	Unconditional Jump
000	1	Conditional Jump
001	0	Return Residue
001	1	Set Bank
010	0	Interrupt
011	0	End Without Interrupt
011	1	End With Interrupt
100	0	Control
101	0	Sense
110	-	Write
111	-	Read

Note that bit 4 is part of the word count for read and write operations.

IOAW FORMAT – COLD LOAD READ COMMAND



IOAW FORMAT – INITIALIZE DATA COMMAND

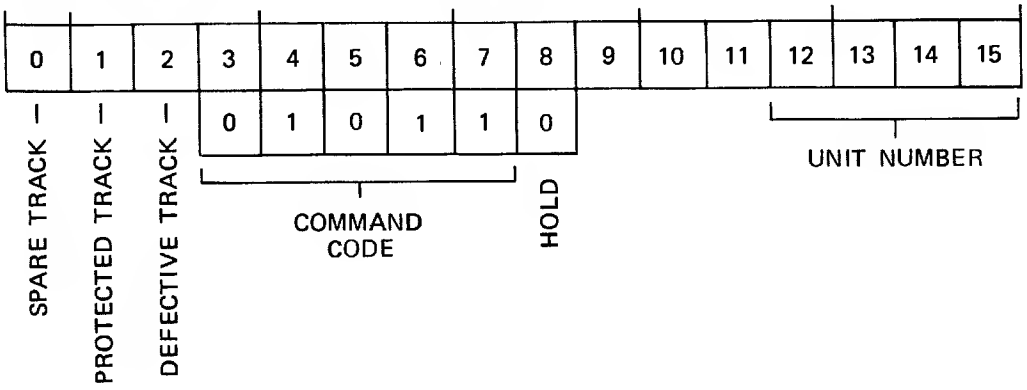
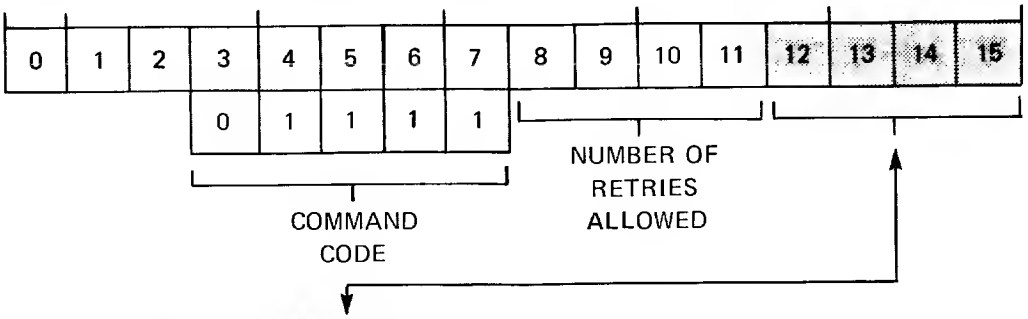


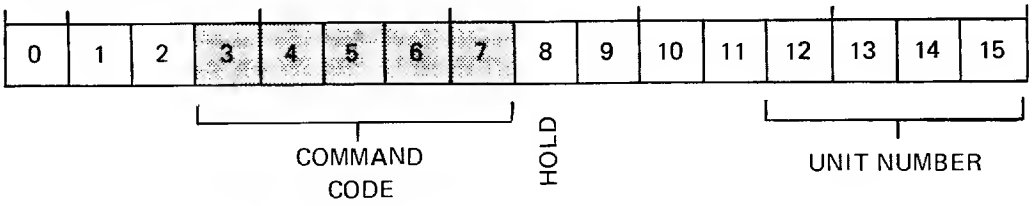
Table D-4. I/O Program Field (Continued)

IOAW FORMAT – SET FILE MASK COMMAND



BIT		MEANING
12	0	Incremental Seek } Bit 12 is Ignored if Bit 15 is clear (0).
	1	Decremental Seek }
13	1	Automatic Seek to Spare Track
14	0	Surface Mode
	1	Cylinder Mode
15	0	Ignore Bit 12
	1	Automatic Seek at End of Cylinder. Direction of Seek is Determined by Bit 12.

IOAW FORMAT – ALL REMAINING COMMANDS



BITS 3 456 7 8	MEANING
0 000 1 1	Recalibrate
0 001 0 1	Seek
0 001 1 0	Request Status
0 010 0 0	Request Sector Address
0 010 1 0	Read Data
0 011 0 0	Read Full Sector
0 011 1 0	Verify
0 100 0 0	Write Data
0 100 1 0	Write Full Sector
0 101 0 0	Clear
0 110 0 0	Address Record
0 110 1 0	Request Syndrome
0 111 0 0	Read with Offset
1 001 0 0	Read without Verify
1 001 1 0	Load TIO Register
1 010 0 0	Request Disc Address
1 010 1 0	End (No-operation)
1 011 0 0	Wake-up

Table D-5. HP 7905/7920/7925 Disc Drive Fault Indicators

The eight LED indicators which are located on the Operator Panel show the occurrence of non-destructive, destructive, servo, and interlock faults.

LED INDICATOR	FAULT NAME	COMMENTS
IL	Interlock	DC power failure, voltage out of tolerance, improper PCA seating, to mention only a few.
T	Timeout	Maximum time limit exceeded for a SEEK, RECAL, or INITIAL LOAD operation.
AGC	Automatic Gain Control	AGC signal lost while heads were over servo surface.
CB	Carriage Back	Successful head load but Carriage Back Detector shows heads still back.
R-W	Read/Write	Simultaneous read and write operations.
MH	Multihead	More than one head active.
DC - $\overline{W}$	DC Write Current • $\overline{\text{Write}}$	Heads receiving write current but drive not in write mode.
W - $\overline{AC}$	Write • $\overline{\text{AC Current}}$	Drive in write mode but data not being written on disc.
W - $\overline{AR}$	Write • $\overline{\text{Access Ready}}$	Heads not positioned over valid cylinder and drive in write mode.